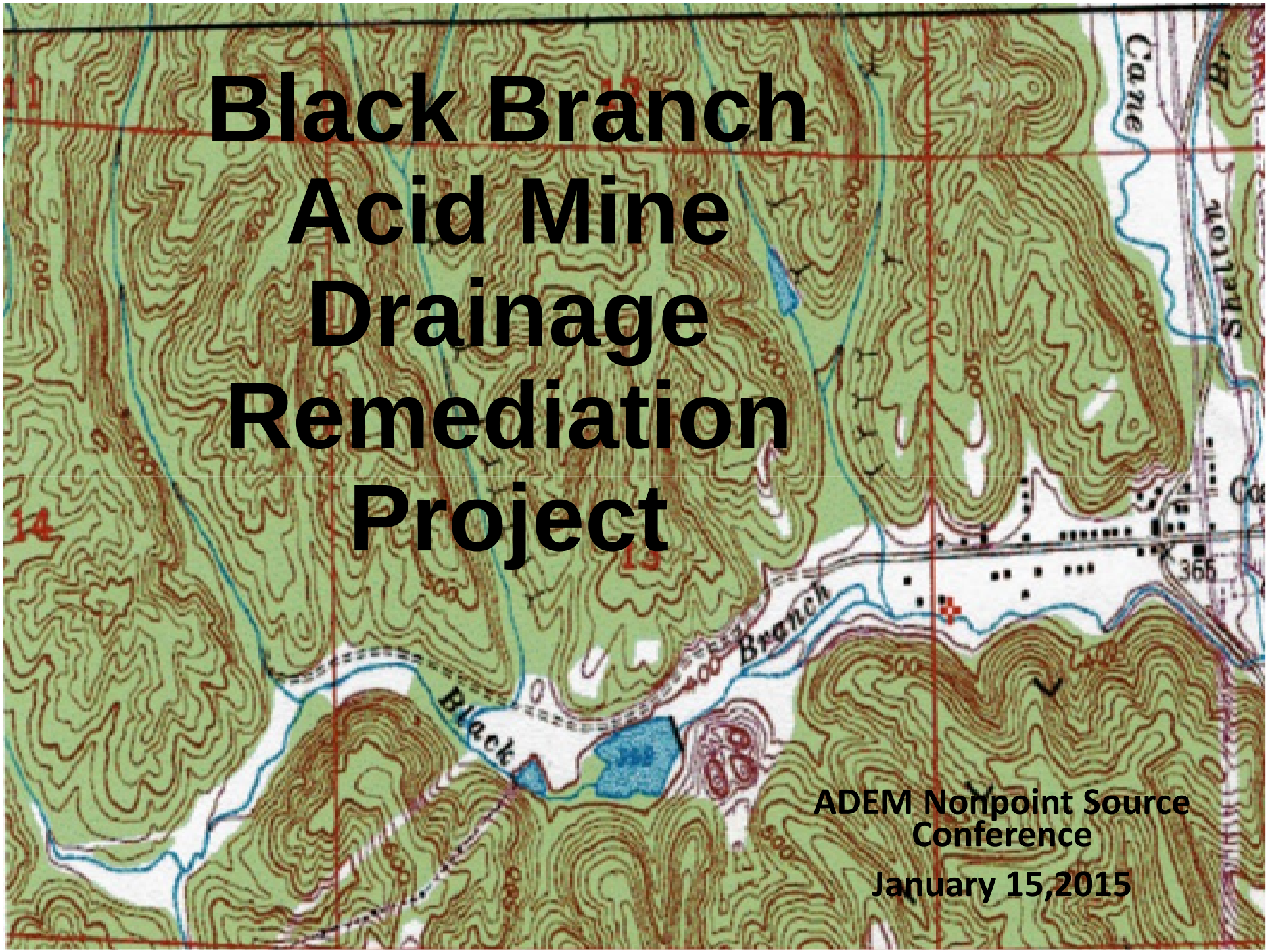
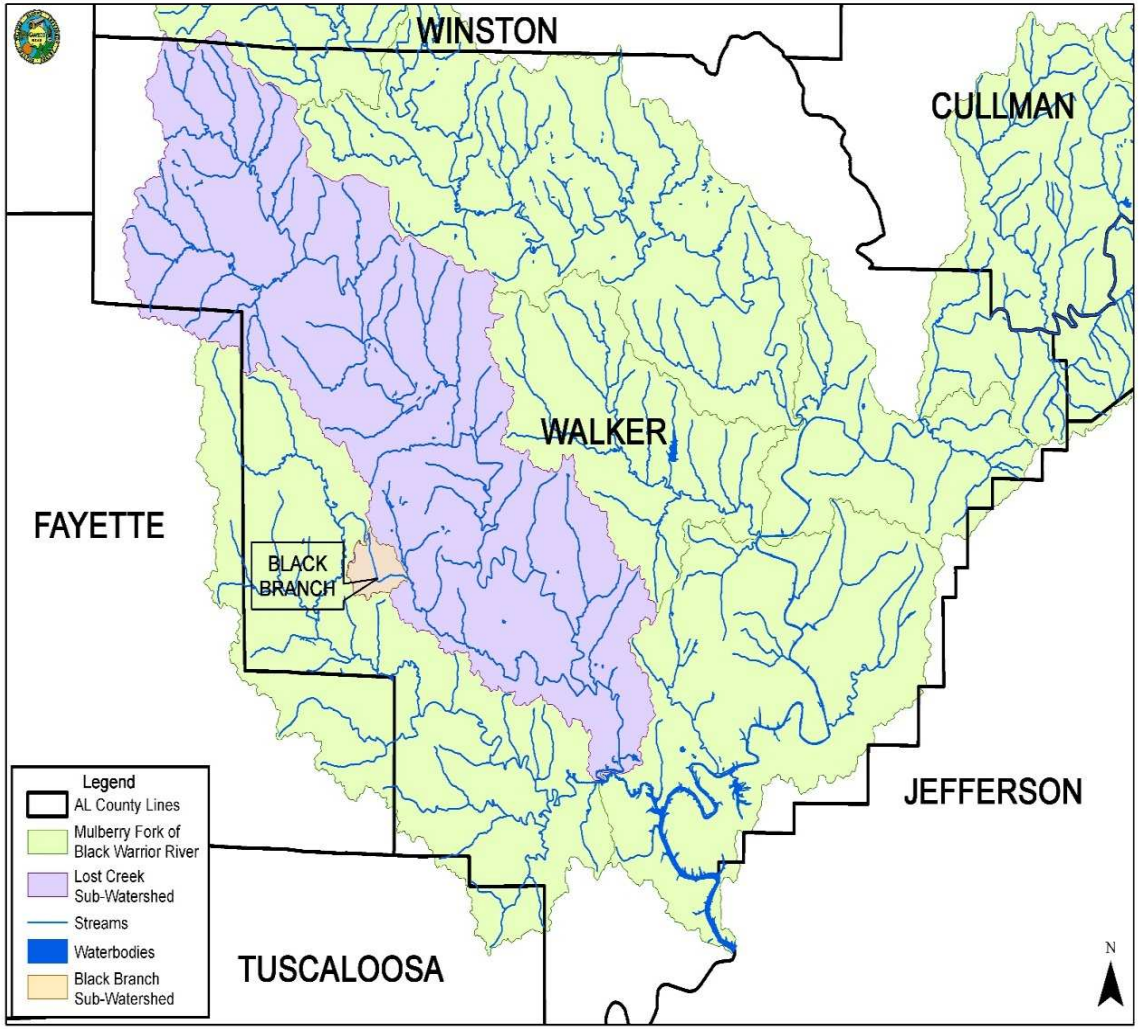
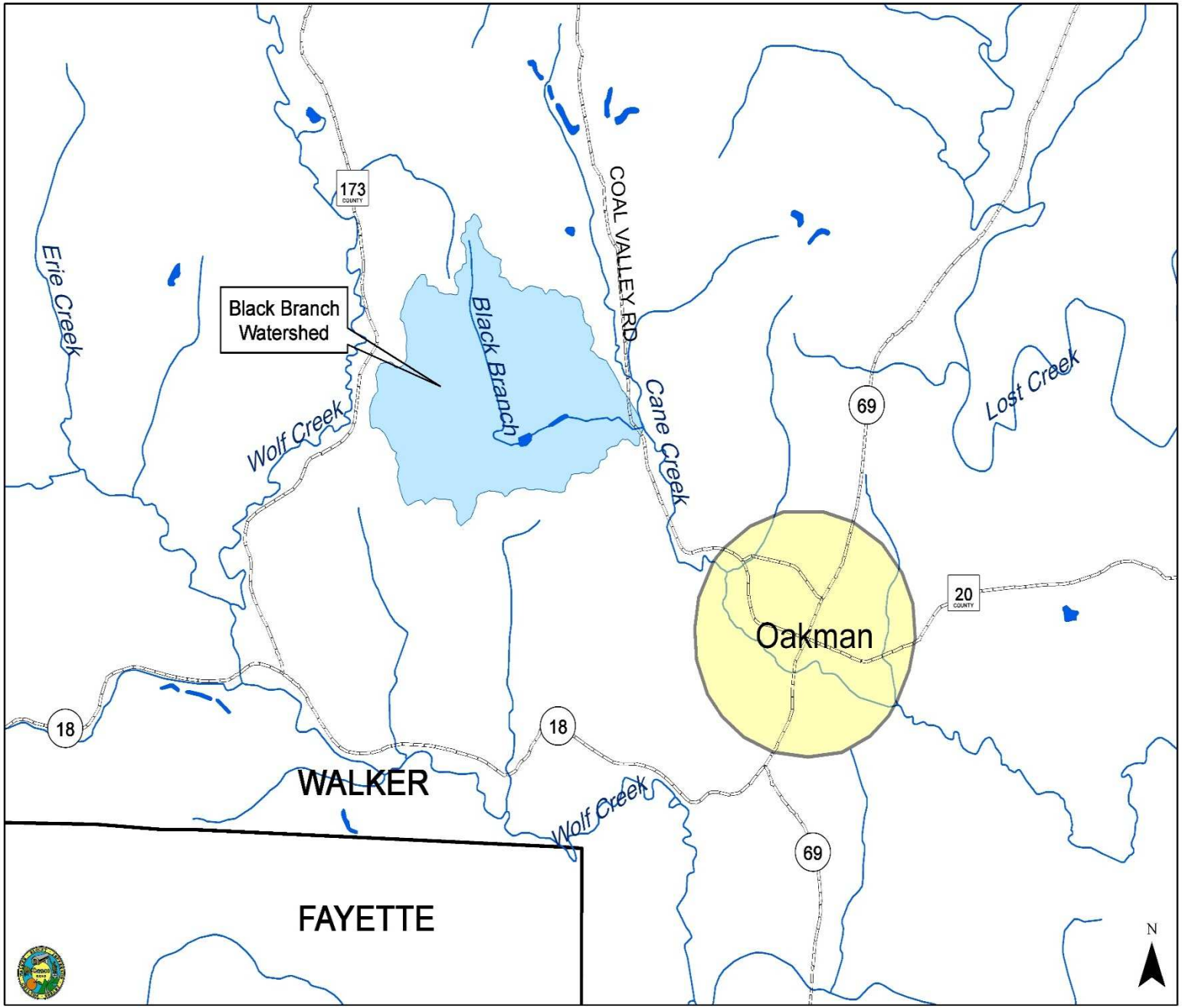

Black Branch
Acid Mine
Drainage
Remediation
Project
Cane
Shallow
Black
Branch
366
ADEM Nonpoint Source
Conference
January 15,2015

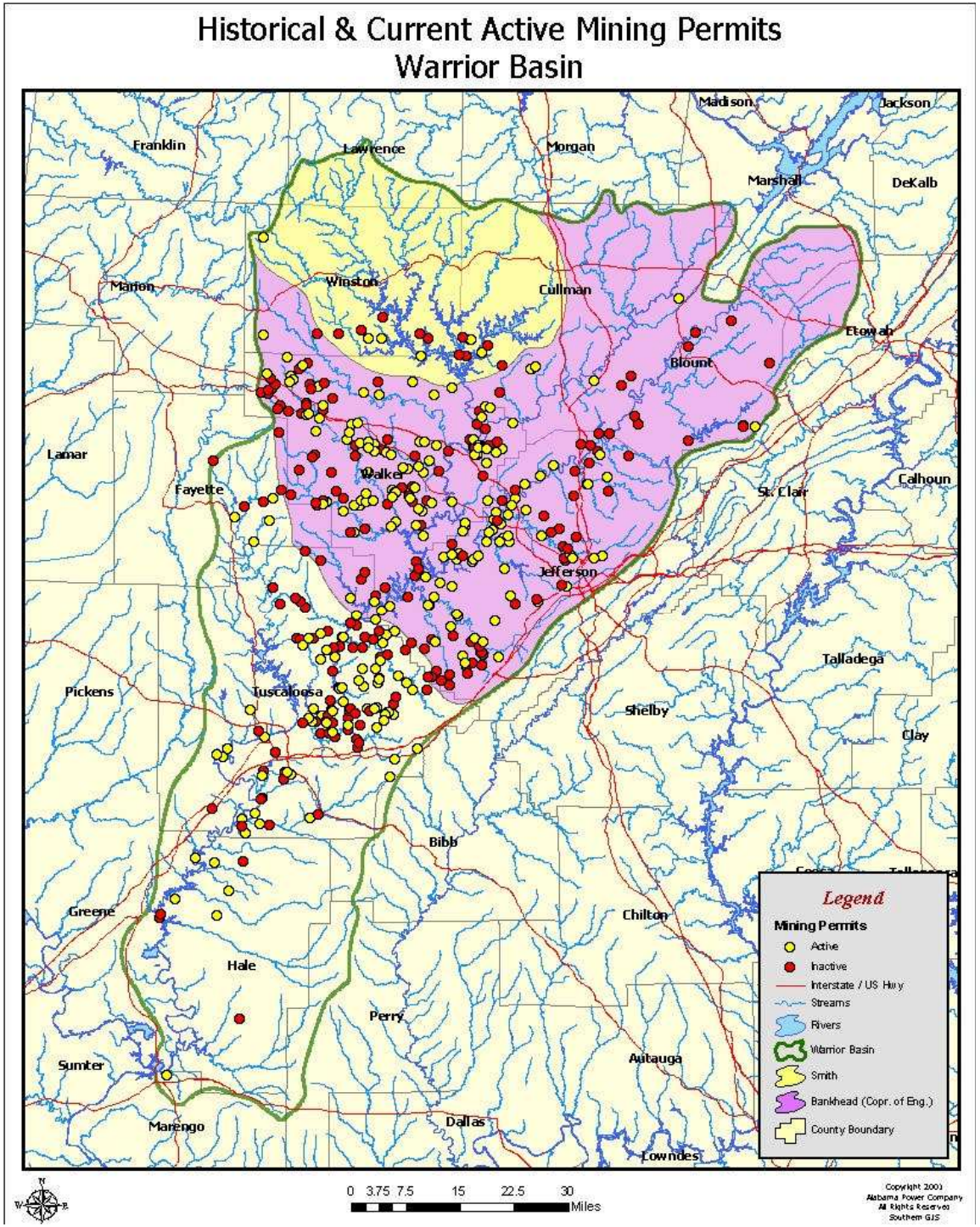
Black Branch

Small Watershed
Drains approximately 3.3 square Miles



- Mulberry Fork Watershed
  - Lost Creek Sub-watershed
- Tributary to Cane Creek – Oakman, Walker Co., AL


Black Branch Watershed
Erie Creek
Wolf Creek
Black Branch
COAL VALLEY RD
Cane Creek
Lost Creek
173
COUNTY
69
20
COUNTY
Oakman
18
18
WALKER
Wolf Creek
69
FAYETTE
N



- Funding for reclamation of abandoned mine land is insufficient to reclaim all sites within a short amount of time.

- In fact, at the current rate of funding, it is estimated that it will take over **30 years** to reclaim sites within Alabama.

Black Branch

Located in *Coal Valley*

Corona Coal Company 1920

Last mined by DeBardeleben - 1945

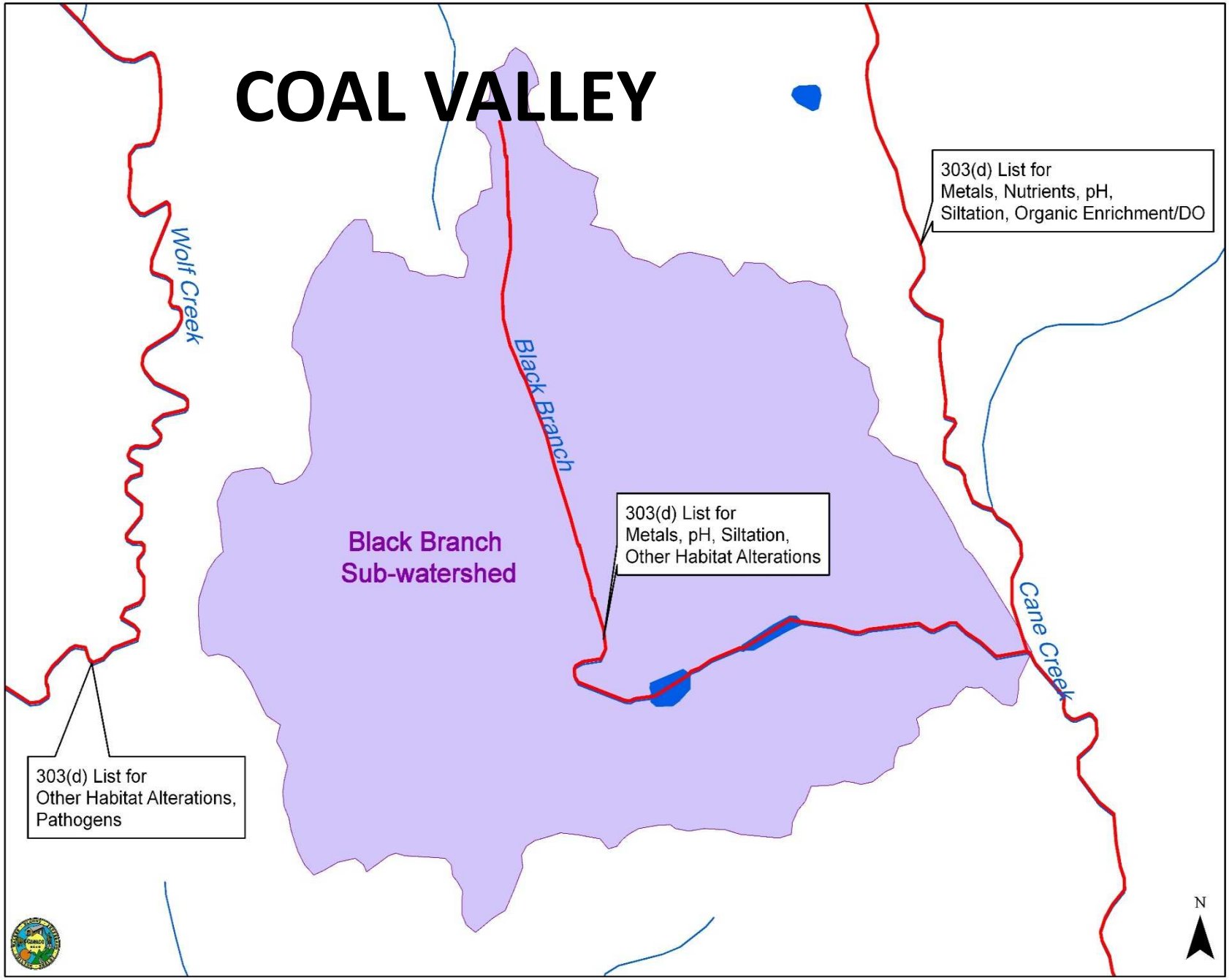
ACID MINE DRAINAGE

12 underground mine entries

13 acres of coal refuse material

2 air shafts

>100 historic individual portals


COAL VALLEY
Wolf Creek
Black Branch
Cane Creek
303(d) List for
Metals, Nutrients, pH,
Siltation, Organic Enrichment/DO
Black Branch
Sub-watershed
303(d) List for
Metals, pH, Siltation,
Other Habitat Alterations
303(d) List for
Other Habitat Alterations,
Pathogens
N


1996

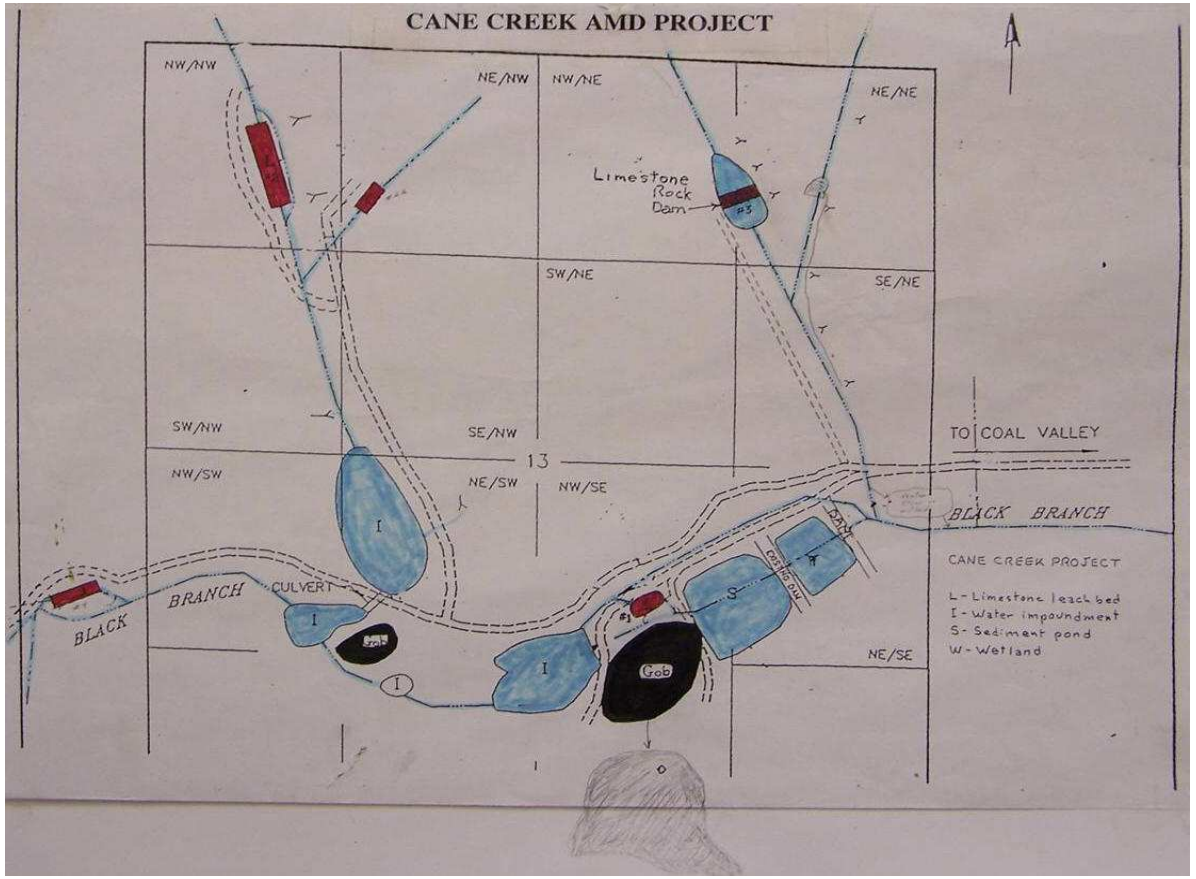
July 1997 – April 1998 PHASE I
Alabama Dept of Labor-Abandoned Mine Land Program (AML)

5 Leach Pits

3.5 Acre Settling Pond

One-Acre Wetland

Series of Settling Ponds



1997-1998 AML PHASE I

One acre wetland

1997-1998 AML PHASE I

Settling Pond

1999-2000 AML PHASE II

USDA/NRCS Partnership

Leach bed improvement

1999-2000 PHASE II Alabama Dept of Labor-Abandoned Mine Land

USDA/NRCS Partnership

Study of aquatic communities by Auburn University

Effectiveness of Reclamation on the Recovery of Aquatic Fauna in Black Branch and Cane Creek. Black, Deirde, Spencer, Karen, Irwin, Elise, and Henry, Ted. Alabama Cooperative Fish and Wildlife Research Unit.

1999-2000 AML PHASE II

April 2000 – June 2000

Clarke University

Released bacteria

Increased pH

Decreased metals

Not cost-effective

June 2000 AML PHASE III

Enhance existing water treatment systems

Construct a passive system for treating AMD from eleven (11) mine portals

Limestone lined leach bed

CANE CREEK IV
WATER ANALYSIS SAMPLING SITES 4, 5 & 6
APRIL, MAY & JUNE, 2006

PARAMETER	SITE 4	SITE 5	SITE 6
pH	3.59	3.32	3.71
Acidity (mg/L)	65.83	99.16	362.33
Alkalinity (mg/L)	<0.01	<0.01	<0.01
Aluminum (mg/L)	2.37	2.66	8.82
Iron (mg/L)	0.28	1.74	41.81
Manganese (mg/L)	1.59	2.93	2.59
Flow (GPM)	494	691	82

PRE-CONSTRUCTION

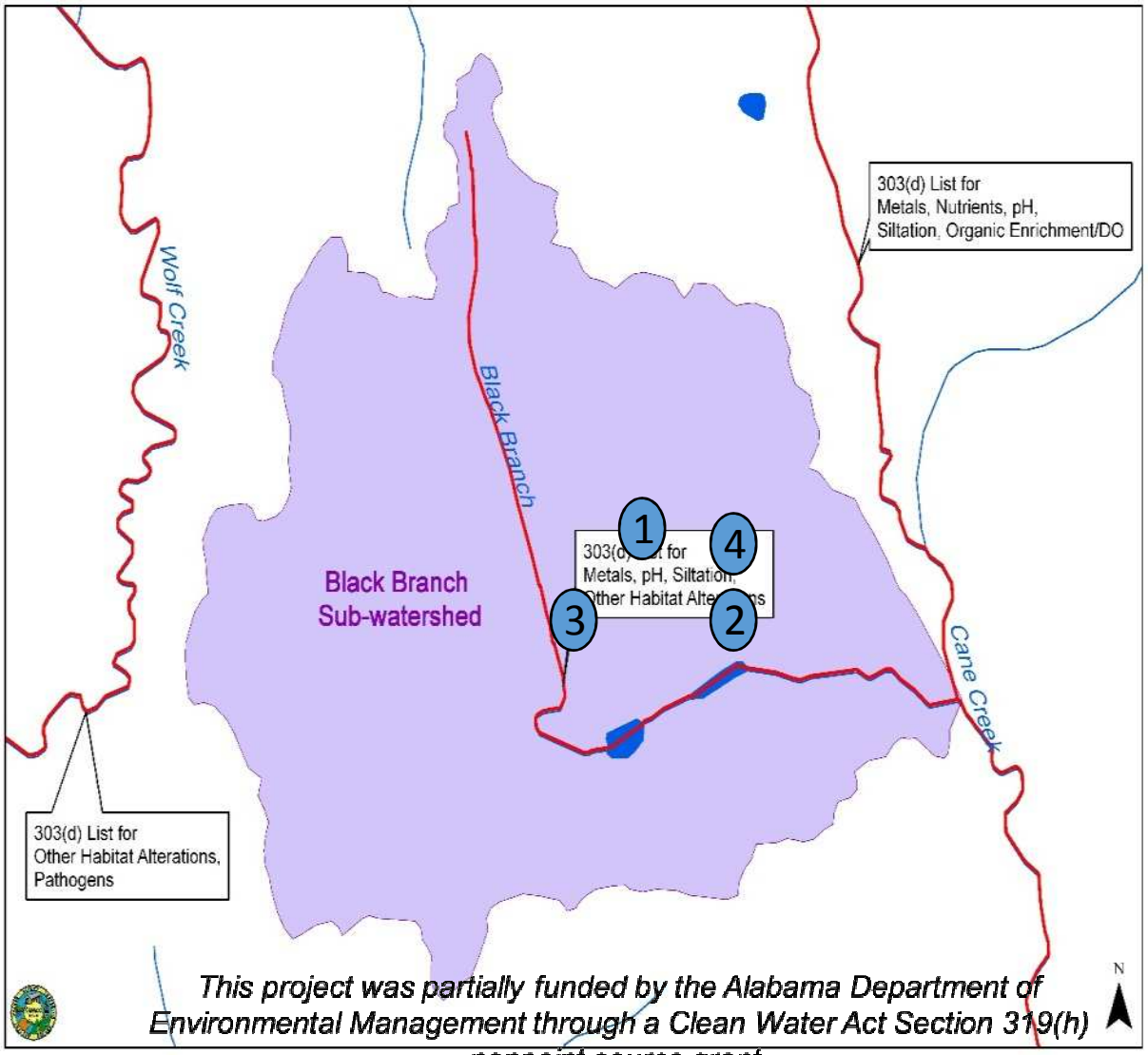
2006 AML Black Branch Remediation
ADEM 319

- Alabama Department of Labor – Abandoned Mine Land Program (Oversight and Funding)
- Alabama Department of Environmental Management (Funding)
- Walker County Soil & Water Conservation District – Reclamation Program (Construction)
- Black Warrior Clean Water Partnership (Watershed Management Plan and Education and Outreach)

This project was partially funded by the Alabama Department of Environmental Management through a Clean Water Act Section 319(h) nonpoint source grant.

Black Branch Remediation 319

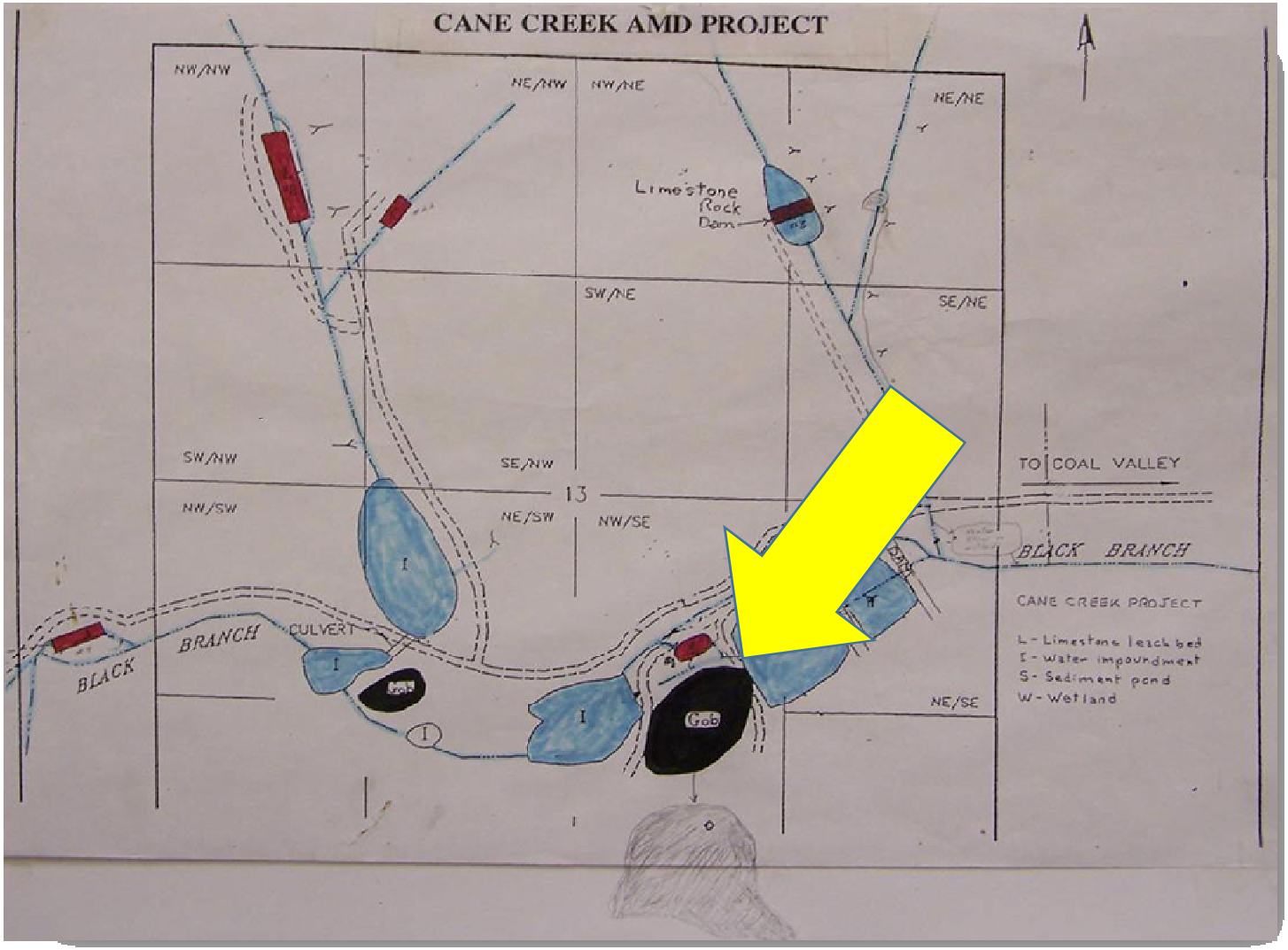
1. Red Branch #1 (before treatment)
2. Red Branch #2 (after treatment)
3. Gob pile
4. Prior to confluence of Black Branch and Cane Creek



This project was partially funded by the Alabama Department of Environmental Management through a Clean Water Act Section 319(h) nonpoint source grant.

Black Branch Remediation 319 Construction begins – 2009

Black Branch 319 – Remediate Gob Pile



Black Branch 319 – Remediate Gob Pile

Black Branch 319 – Remediate Gob Pile

Black Branch 319 – Remediate Gob Pile


03/04/2010

Black Branch 319 – Remediate Gob Pile

Black Branch 319 – Remove Gob Pile

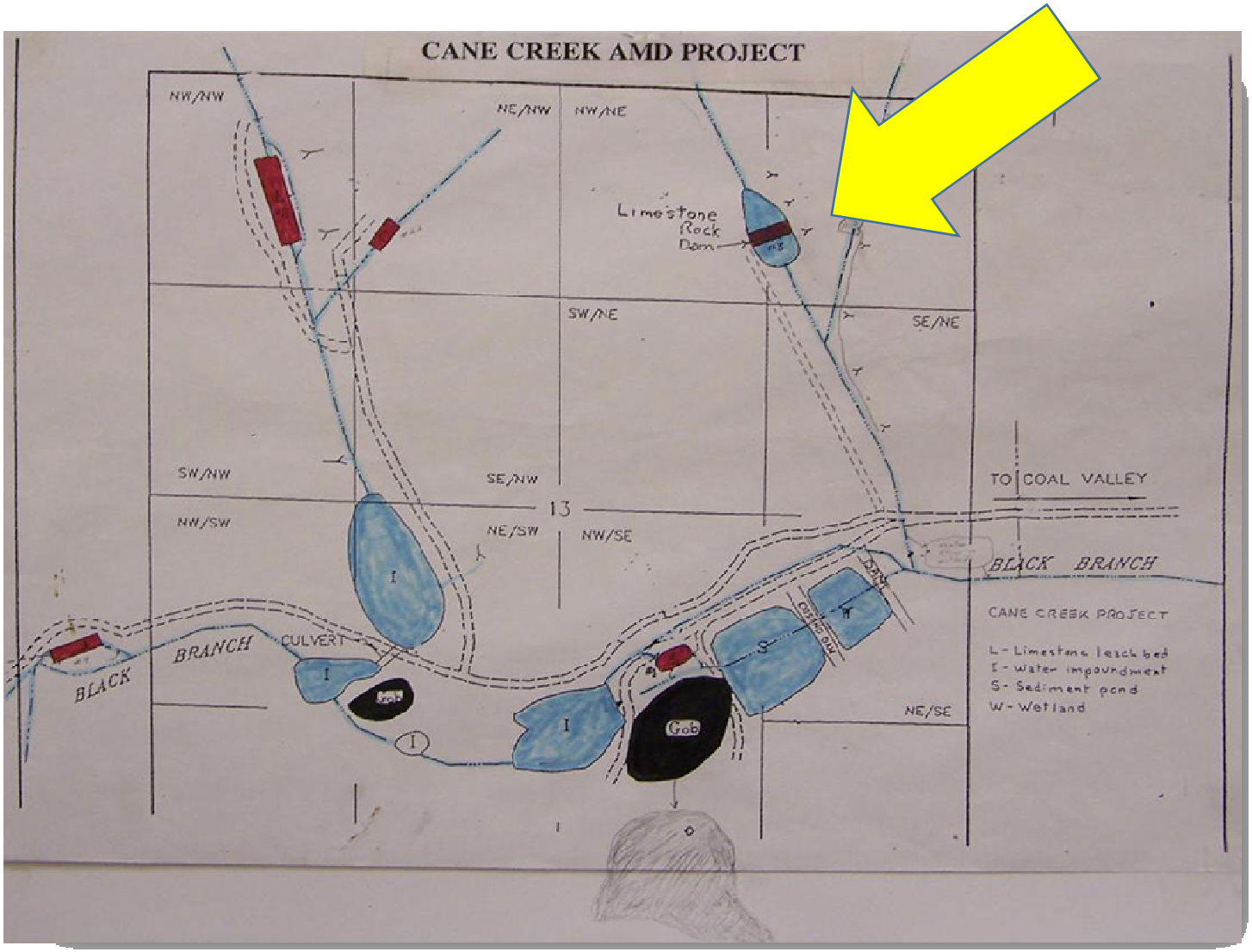
Black Branch 319 – Remove Gob Pile

2” clay

Geotextile

7” topsoil

Black Branch 319 – Red Branch Treatment



Black Branch 319 – Red Branch Treatment

Black Branch 319 – Red Branch Treatment

Black Branch Education & Outreach

Field tours to site by

AML and

Black Warrior Clean Water Partnership

Educate professionals and others on AML remediation techniques

Black Branch – Final Numbers

$ 255,000	ADEM 319 Funding
$ 808,368	AML – Alabama Department of Labor
$1,063,368	TOTAL ADEM PROJECT VALUE
$1,400,000	AML – Phase I-VI
$2,463,368	TOTAL COST OF 10 YEAR REMEDIATION

This project was partially funded by the Alabama Department of Environmental Management through a Clean Water Act Section 319(h) nonpoint source grant.

Data Availability and Analysis

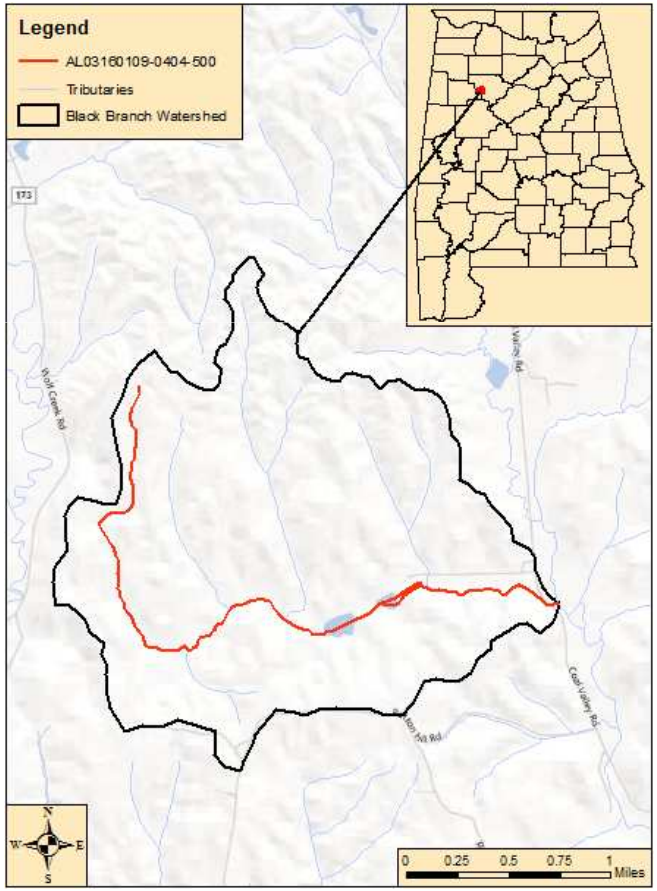
Taylor Griswell
ADEM, WQ

adem.alabama.gov

Background

Black Branch

- Total Length: 4.11 miles
- Drainage Area: 3.36 sq. mi.
- Use Classification: Fish and Wildlife
- Level IV Eco-region: 68f
- Listed in 1998 on Alabama's §303(d) list
    - Metals (Aluminum, Iron)
    - pH
    - Siltation (habitat alteration)
- Currently on Alabama's §303(d) list for pH and metals (Al)
- Delisted for metals (Fe) and Siltation (habitat alteration) in 2014
- Impairment extends from Cane Creek to its source
- Source of Impairment: Abandoned surface mining



Data Summary

- Data Summary
  - Data collected in 2007 and 2012 (chemical, physical, and metals)
  - Collected from one station: BKBW-1

Physical Parameters:

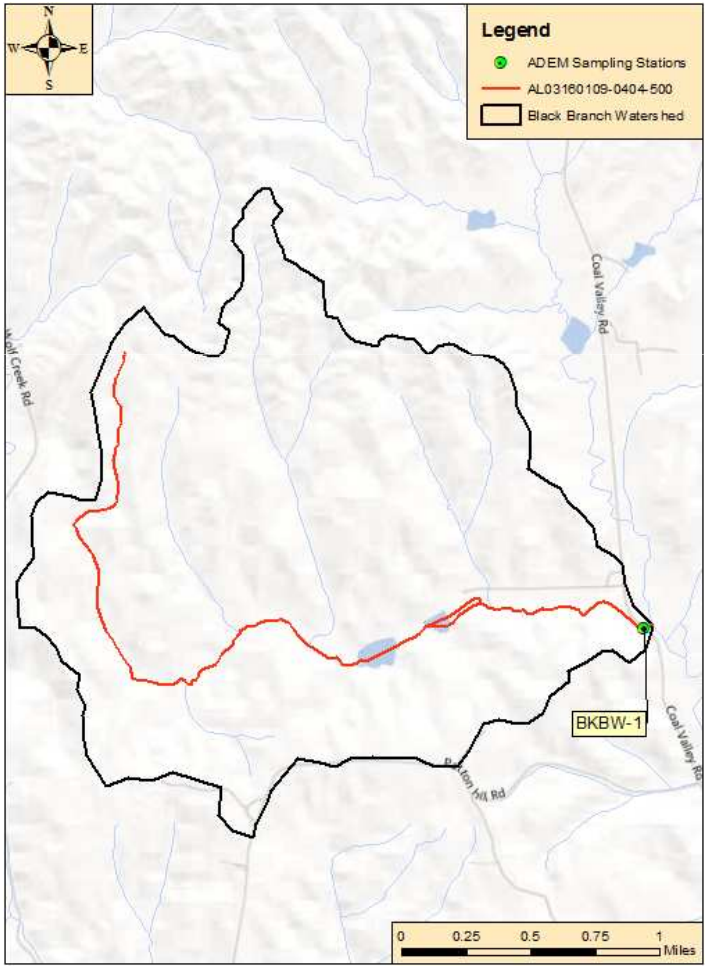
-Temperature
-Turbidity
-Stream Flow
-Total Dissolved Solids
-Specific Conductivity
-Total Suspended Solids
-Alkalinity

Chemical Parameters:

-Dissolved Oxygen
-Dissolved Reactive Phosphorus
-pH
-Total Phosphorus
- Ammonia Nitrogen
-CBOD5
-Nitrate + Nitrite Nitrogen
-Chlorides
-Total Kjeldahl Nitrogen
-Total Nitrogen

Metal Parameters:

- Iron
-Aluminum



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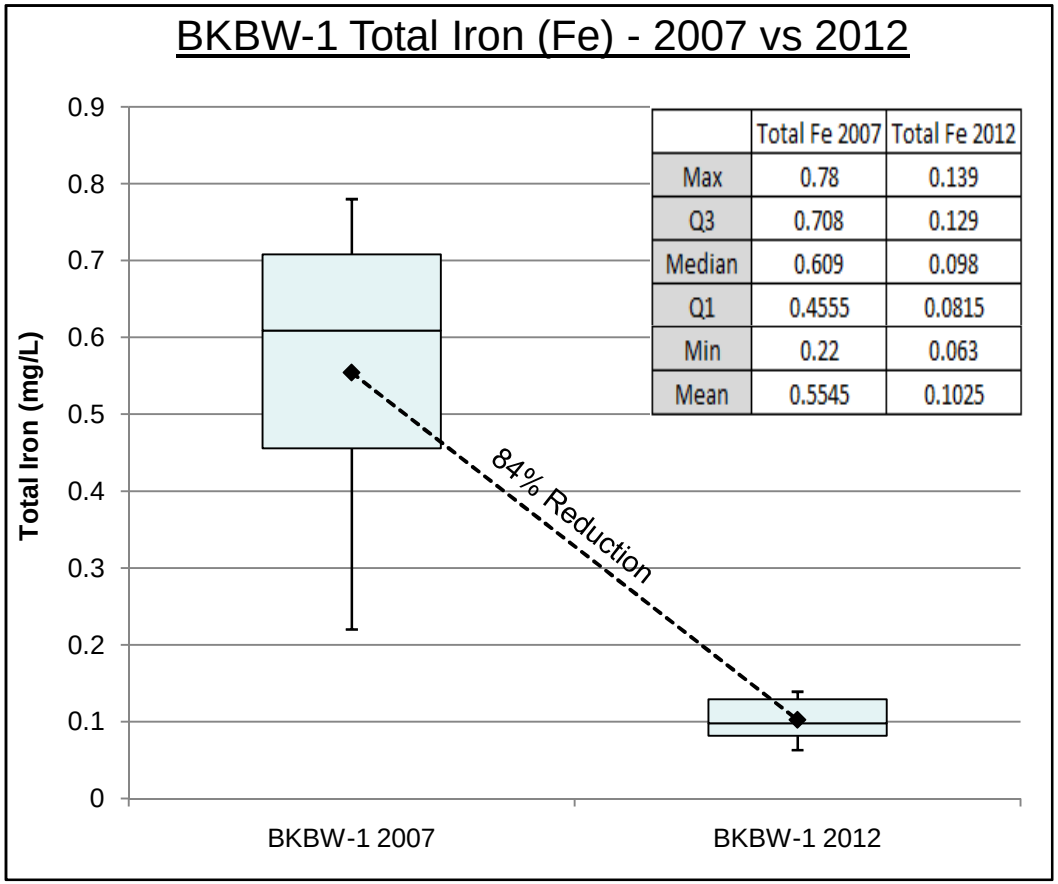
Data Availability and Analysis

- Iron
  - Samples collected:
    - 12 dissolved iron
    - 12 total recoverable iron
  - All total iron under EPA recommended criteria of 1.0 mg/L
  - Dissolved and Total iron both below Eco-reference values



	Total Fe 2007	Total Fe 2012
Max	0.78	0.139
Q3	0.708	0.129
Median	0.609	0.098
Q1	0.4555	0.0815
Min	0.22	0.063
Mean	0.5545	0.1025

Data Availability and Analysis

- Siltation (habitat alteration)
  - Data collected in 2007 and 2012
  - Samples Collected
    - 11 Total Suspended Solids (TSS)
    - 14 Turbidity
  - TSS samples below eco-ref values
  - Turbidity samples below eco-ref values

Station ID	Visit Date	TSS (mg/L)	TSS Detect Condition	Turbidity (NTU)	Turbidity Detect Condition	Turbidity Ecoref 90th %tile
BKBW-1	3/14/2007	1		0.84		10.1
BKBW-1	4/3/2007	2		0.59		10.1
BKBW-1	5/8/2007	4		1.25		10.1
BKBW-1	7/10/2007	2		0.95		10.1
BKBW-1	10/2/2007			0.41		10.1
BKBW-1	4/11/2012	1	< MDL 1	0.41		10.1
BKBW-1	5/2/2012	1	< MDL 1	0.4		10.1
BKBW-1	5/8/2012			2.54		10.1
BKBW-1	6/6/2012	1	< MDL 1	1.02		10.1
BKBW-1	7/18/2012	1	< MDL 1	1.84		10.1
BKBW-1	8/15/2012	1	< MDL 1	0.59		10.1
BKBW-1	9/12/2012		< MDL 1	0.77		10.1
BKBW-1	10/3/2012	1	< MDL 1	1.01		10.1
BKBW-1	11/6/2012	1	< MDL 1	1.61		10.1
	Median:	1				
	Eco-ref 90th %tile:	14.00				

MDL: Method Detection Limit

Data Availability and Analysis

Table 3. Results of the habitat assessment conducted on Black Br at BKBW-1, May 8, 2012. Macroinvertebrates were also collected.

Habitat Assessment	%Maximum Score	Rating
RR		
Instream Habitat Quality	63	Sub-optimal (59-70)
Sediment Deposition	75	Optimal >70
Sinuosity	85	Optimal >84
Bank and Vegetative Stability	69	Sub-optimal (60-74)
Riparian Buffer	33	Poor <50
Habitat Assessment Score	**157**	
% Maximum Score	**65**	Sub-optimal (59-70)

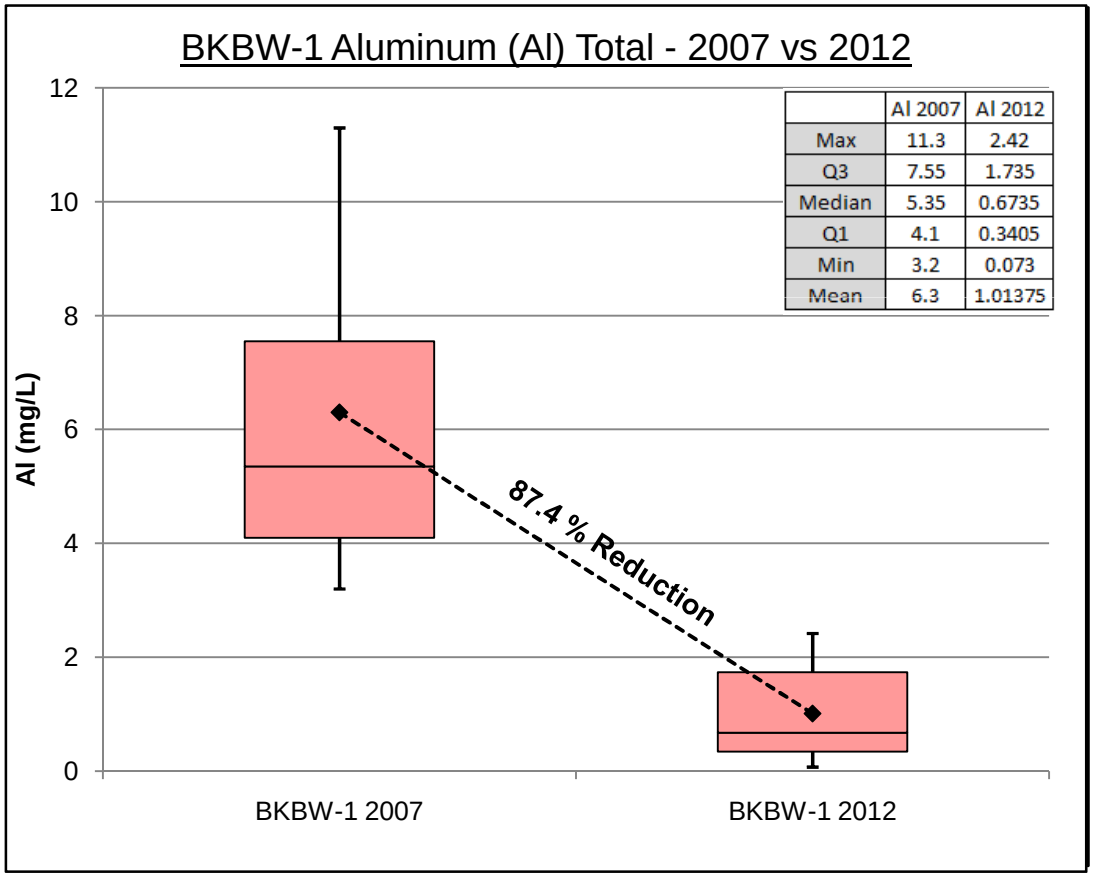
Macroinvertebrate Assessment (Completed 5/8/2012 10:55)		
	Results	**Scores**
Taxa richness measures		**(0-100)**
# EPT taxa	7	13
Taxonomic composition measures		
% Non-insect taxa	4	92
% Dominant taxon	36	30
% EPC taxa	15	25
Functional feeding group measures		
% Predators	21	91
Tolerance measures		
% Taxa as Tolerant	29	57
WMB-I Assessment Score	---	**51**
WMB-I Assessment Rating		**Fair (39-58)**

- Data Summary
  - Habitat Assessment and Macroinvertebrate Assessment
    - Habitat Assessment classified as “Sub-Optimal”
    - Macroinvertebrate Assessment rated as “Fair”
  - Further proof of no impairment for Siltation

Data Availability and Analysis

- Aluminum
  - Data collected in 2007 and 2012
  - Over an 80 % Reduction from 2007 to 2012

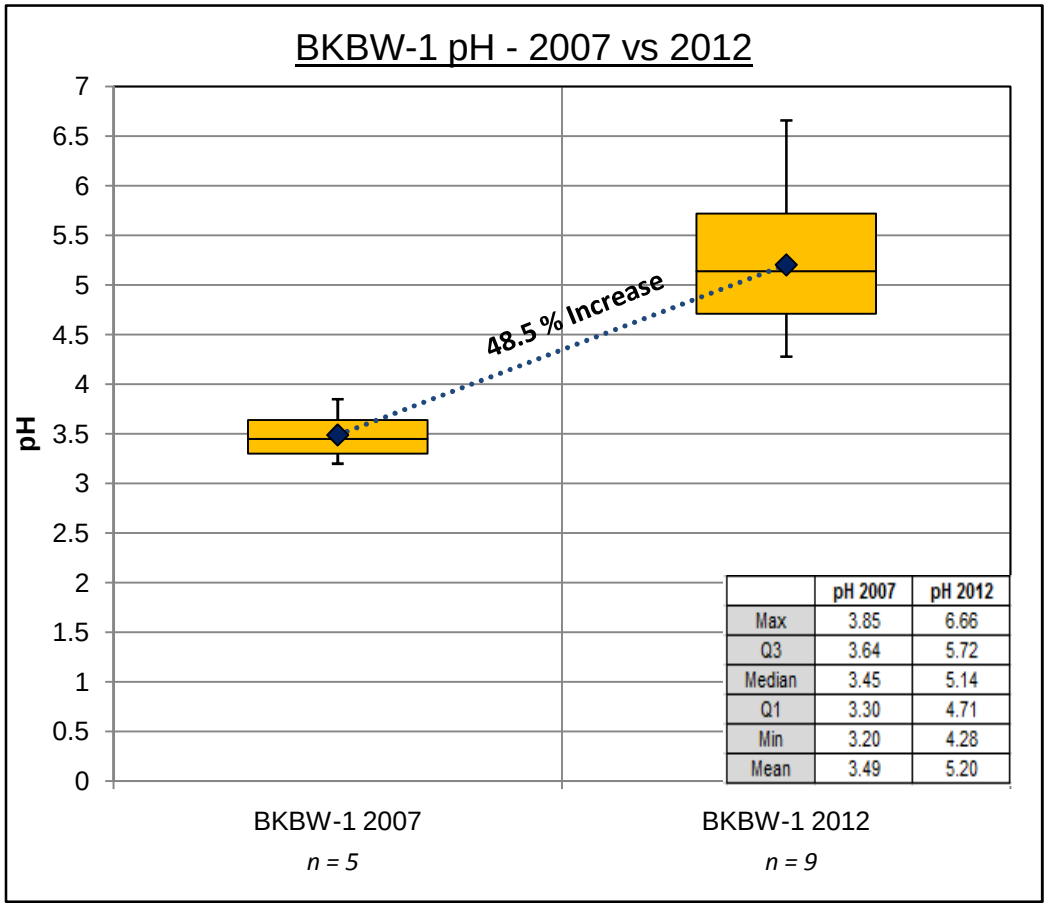
BKBW-1 Aluminum Data Summary			
	Al Dissolved		Al Total
2007 Median:	5.350		5.350
2012 Median:	0.625		0.674
All Data Median:	1.795		1.850



	Al 2007	Al 2012
Max	11.3	2.42
Q3	7.55	1.735
Median	5.35	0.6735
Q1	4.1	0.3405
Min	3.2	0.073
Mean	6.3	1.01375

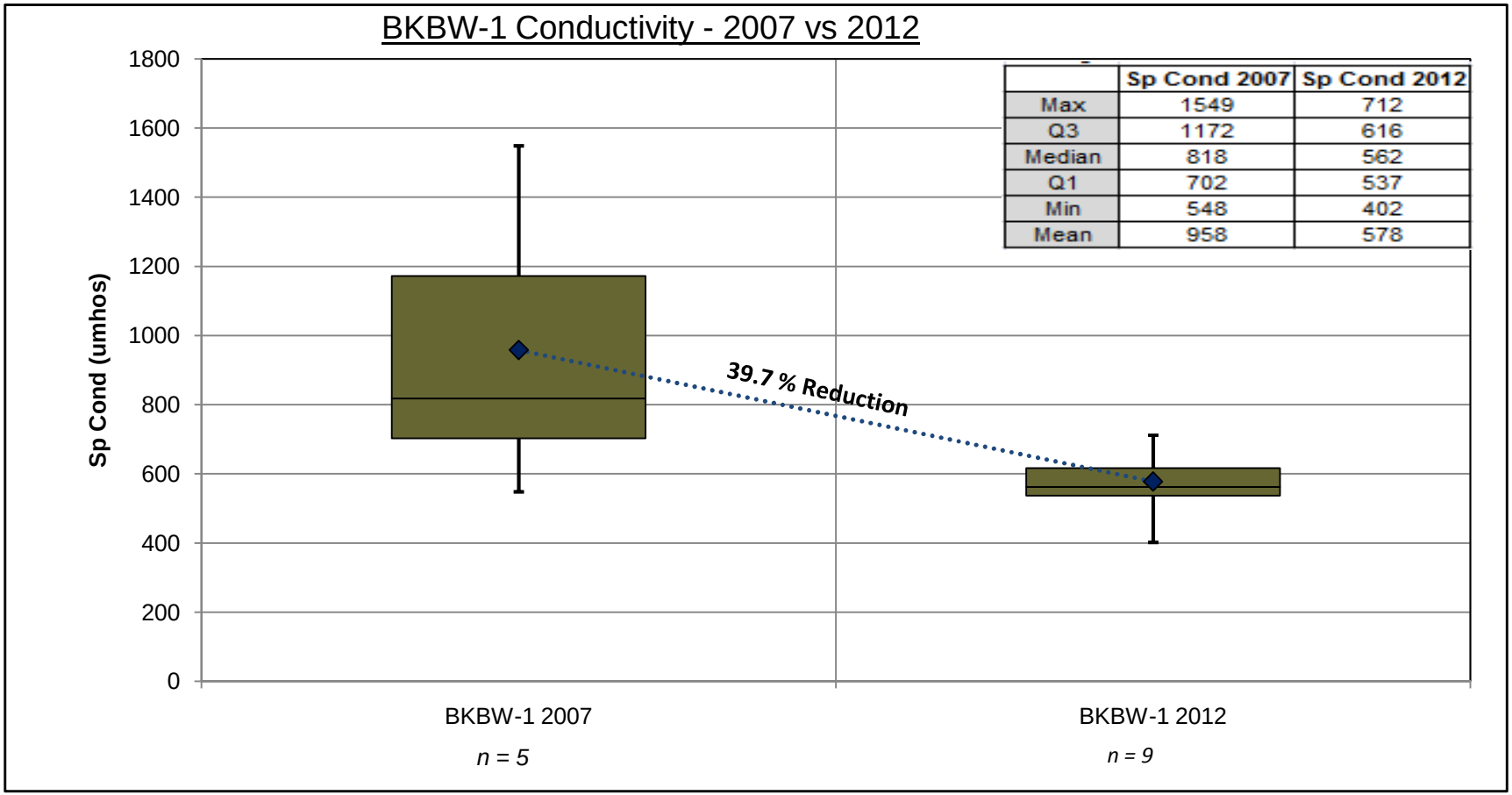
Data Availability and Analysis

- pH
  - 14 Samples Collected
  - pH Criteria:
    - 6 SU – 8.5 SU
  - Samples very low (acidic)
  - 48.5 % Increase from 2007 to 2012



	pH 2007	pH 2012
Max	3.85	6.66
Q3	3.64	5.72
Median	3.45	5.14
Q1	3.30	4.71
Min	3.20	4.28
Mean	3.49	5.20

Other Improvements



	Sp Cond 2007	Sp Cond 2012
Max	1549	712
Q3	1172	616
Median	818	562
Q1	702	537
Min	548	402
Mean	958	578

Conclusion

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